

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2018/2019

DCS5028 – DISCRETE STRUCTURES

(For DIT/DBIS students only)

1 MARCH 2019
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This examination paper consists of 4 pages.
2. There are 5 structured questions.
3. Write all answers in the **Answer Booklet** provided.

STRUCTURED QUESTIONS (TOTAL: 50 Marks)

Answer all questions and show necessary workings in the answer booklet provided.

QUESTION 1 (10 Marks)

- A. For the following compound proposition: $(\neg p \vee \neg q) \rightarrow ((r \wedge \neg q) \leftrightarrow p)$, determine if it is a tautology, contradiction or contingency. [4 Marks]
- B. State the inverse, converse and contrapositive for the following proposition:
"If I am a Malaysian, then I am Asian."
[3 Marks]
- C. Given $X = \{x \mid 0 < x < 35\}$ and $Y = \{y \mid 5 < y < 60\}$ where f is a function mapping X to Y . Let $f(5) = 30, f(10) = 20, f(15) = 10, f(20) = 50, f(25) = 40$ and $f(30) = 30$.
- I. Draw its arrow diagram and find its domain and co-domain. [2 Marks]
- II. Determine if it is injective, surjective and bijective. [1 Mark]

QUESTION 2 (10 Marks)

- A. Use a mathematical induction to prove that

$$S_n = 2 + 7 + 12 + \dots + (5n - 3) = \frac{n(5n - 1)}{2}$$

is true for all positive integers.

[7 Marks]

- B. Consider the following function.

[3 Marks]

```
int recurse (int x)
{
    if (x == 1)
        return 1;
    else
        return (5 * x) + recurse (x - 1);
}
```

Show the tracing process to derive the result by this function call: **recurse (5)**.

Continued...

QUESTION 3 (10 Marks)

A. By using the Euclidean Algorithm, find :

- I. Greatest Common Divisor (GCD) for the numbers of 514 and 107. [1.5 Marks]
- II. The value of s and t satisfying that $514s + 107t = \text{GCD}(514, 107)$. [3.5 Marks]
- III. Least Common Multiple (LCM) (514, 107) [1 Mark]

B. How many 3-digit numbers can be formed with the digits 5, 3, 2, 7, 9, 8 if the digits are not repeated? [1 Mark]

C. In how many ways can the letters of the word "HIPPOPOTAMUS" be arranged? [3 Marks]

QUESTION 4 (10 Marks)

A. Find the degree of each vertex for the graph shown in **Diagram 1**. [5 Marks]

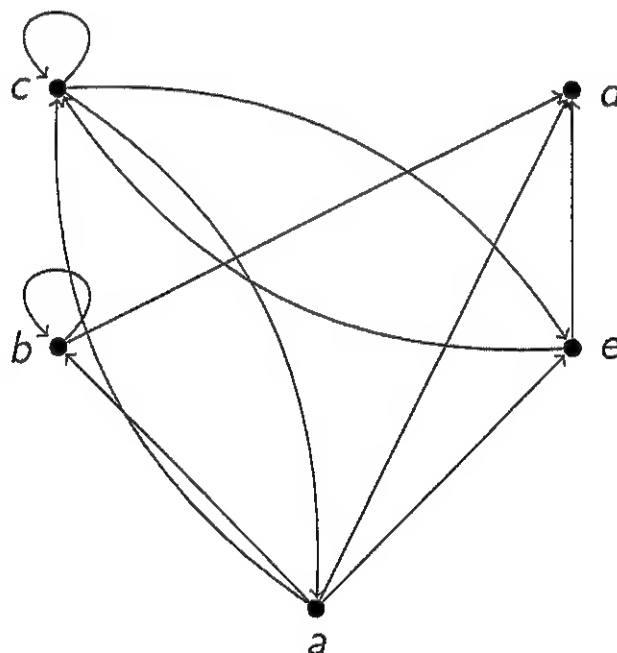


Diagram 1

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B. Given a tree diagram shown in **Diagram 2**:

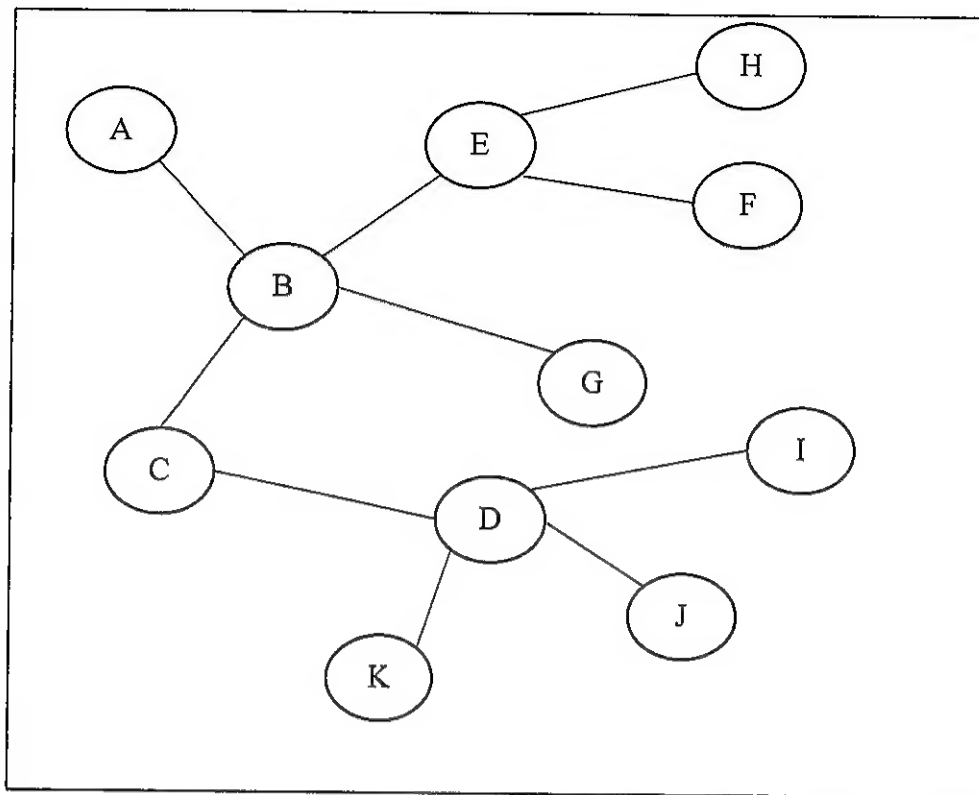


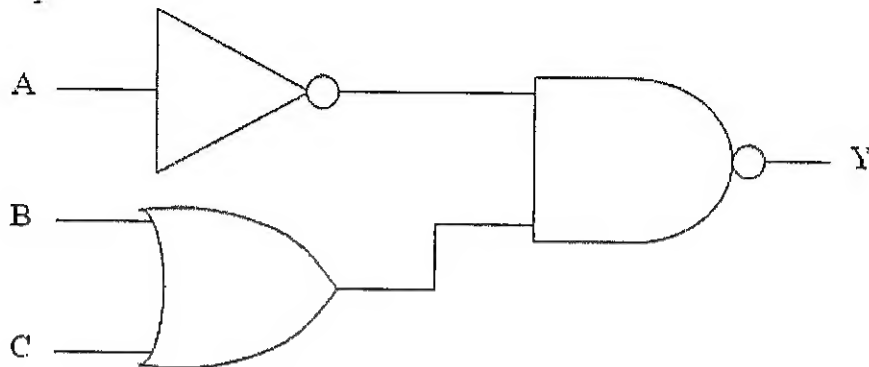
Diagram 2

- I. Redraw the tree above with **B** as the root. [2 Marks]
- II. Based on the newly constructed rooted tree in **Part (I)**, find the following:
 - a. Parent of D. [0.5 Mark]
 - b. Siblings of C. [0.5 Mark]
 - c. Leaf nodes. [0.5 Mark]
 - d. Ancestors of F. [0.5 Mark]
- III. Draw the sub tree rooted at **C**. [1 Mark]

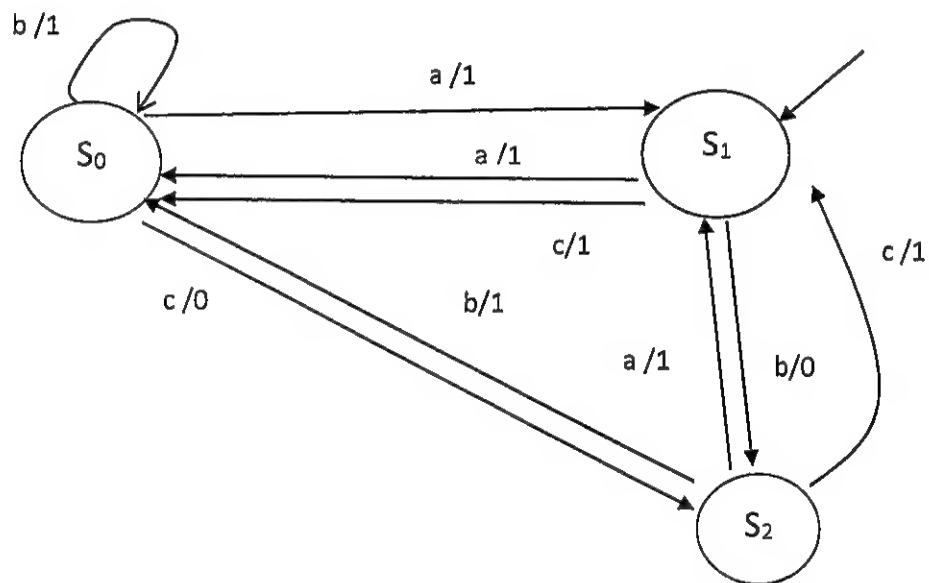
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QUESTION 5 (10 Marks)

- A. Write the *logical expression* that corresponds to following circuit and construct the *truth table*. [6 Marks]



- B. Given the following finite state machine diagram, redraw the transition diagram as the diagram of a finite state automaton. [4 Marks]



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